

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

- 1           1. (Currently amended) A method for generating code to perform  
2     anticipatory prefetching for data references, comprising:  
3           receiving code to be executed on a computer system;  
4           analyzing the code to identify data references to be prefetched;  
5           calculating a prefetch ahead distance, wherein the prefetch ahead distance  
6     includes the ratio of outstanding prefetches to the number of prefetch streams, and  
7     wherein the prefetch ahead distance indicates how many loop iterations ahead to  
8     prefetch for; and  
9           inserting prefetch instructions into a preceding basic block of the code in  
10    advance of the identified data references based upon the prefetch ahead distance,  
11    wherein inserting prefetch instructions involves inserting multiple prefetch  
12    instructions for a given cache line, and wherein inserting the prefetch instructions  
13    involves,  
14                    attempting to calculate a stride value for a given data  
15                    reference within a loop,  
16                    if the stride value cannot be calculated, setting the stride  
17                    value to a default stride value, and  
18                    inserting a prefetch instruction to prefetch the given data  
19                    reference for a subsequent loop iteration based on the stride value;  
20           wherein the stride value is constant for some but not necessarily all loop  
21    iterations.

1           2. (Original) The method of claim 1, further comprising allowing a system  
2 user to specify the default stride value.

1           3. (Original) The method of claim 1, wherein calculating the stride value  
2 involves:

3           identifying an induction variable for the stride value;  
4           identifying a stride function for the stride value; and  
5           calculating the stride value based upon the stride function and the  
6 induction variable.

1           4. (Original) The method of claim 1, wherein inserting the prefetch  
2 instruction based on the stride value involves:

3           calculating a prefetch cover distance by dividing a cache line size by the  
4 stride value;  
5           calculating a prefetch ahead distance as a function of a prefetch latency,  
6 the prefetch cover distance and an execution time of a loop; and  
7           calculating a prefetch address by multiplying the stride value by the  
8 prefetch cover distance and the prefetch ahead distance and adding the result to an  
9 address accessed by the given data reference.

1           5. (Original) The method of claim 1, wherein analyzing the code involves:  
2           identifying loop bodies within the code; and  
3           identifying data references to be prefetched from within the loop bodies.

1           6. (Original) The method of claim 5, wherein analyzing the code to  
2 identify data references to be prefetched involves examining a pattern of data  
3 references over multiple loop iterations.

1           7. (Original) The method of claim 1, wherein analyzing the code involves  
2 analyzing the code within a compiler.

1           8. (Currently amended) A computer-readable storage medium storing  
2 instructions that when executed by a computer cause the computer to perform a  
3 method for generating code to perform anticipatory prefetching for data  
4 references, the method comprising:  
5           receiving code to be executed on a computer system;  
6           analyzing the code to identify data references to be prefetched;  
7           calculating a prefetch ahead distance, wherein the prefetch ahead distance  
8 includes the ratio of outstanding prefetches to the number of prefetch streams, and  
9 wherein the prefetch ahead distance indicates how many loop iterations ahead to  
10 prefetch for; and  
11           inserting prefetch instructions into a preceding basic block of the code in  
12 advance of the identified data references based upon the prefetch ahead distance,  
13 wherein inserting prefetch instructions involves inserting multiple prefetch  
14 instructions for a given cache line, and wherein inserting the prefetch instructions  
15 involves,  
16                   attempting to calculate a stride value for a given data  
17                   reference within a loop,  
18                   if the stride value cannot be calculated, setting the stride  
19                   value to a default stride value, and  
20                   inserting a prefetch instruction to prefetch the given data  
21                   reference for a subsequent loop iteration based on the stride value;  
22           wherein the stride value is constant for some but not necessarily all loop  
23 iterations.

1           9. (Original) The computer-readable storage medium of claim 8, wherein  
2 the method further comprises allowing a system user to specify the default stride  
3 value.

1           10. (Original) The computer-readable storage medium of claim 8, wherein  
2 calculating the stride value involves:  
3           identifying an induction variable for the stride value;  
4           identifying a stride function for the stride value; and  
5           calculating the stride value based upon the stride function and the  
6 induction variable.

1           11. (Original) The computer-readable storage medium of claim 8, wherein  
2 inserting the prefetch instruction based on the stride value involves:  
3           calculating a prefetch cover distance by dividing a cache line size by the  
4 stride value;  
5           calculating a prefetch ahead distance as a function of a prefetch latency,  
6 the prefetch cover distance and an execution time of a loop; and  
7           calculating a prefetch address by multiplying the stride value by the  
8 prefetch cover distance and the prefetch ahead distance and adding the result to an  
9 address accessed by the given data reference.

1           12. (Original) The computer-readable storage medium of claim 8, wherein  
2 analyzing the code involves analyzing the code within a compiler.

1           13. (Currently amended) An apparatus that generates code to perform  
2 anticipatory prefetching for data references, comprising:  
3           a receiving mechanism that is configured to receive code to be executed on  
4 a computer system;

5 an analysis mechanism that is configured to analyze the code to identify  
6 data references to be prefetched;  
7 a calculating mechanism that is configured to calculate a prefetch ahead  
8 distance, wherein the prefetch ahead distance includes the ratio of outstanding  
9 prefetches to the number of prefetch streams, and wherein the prefetch ahead  
10 distance indicates how many loop iterations ahead to prefetch for; and  
11 an insertion mechanism that is configured to insert prefetch instructions  
12 into a preceding basic block of the code in advance of the identified data  
13 references based upon the prefetch ahead distance, wherein the insertion  
14 mechanism facilitates inserting multiple prefetch instructions for a given cache  
15 line;  
16 wherein the insertion mechanism is configured to,  
17 attempt to calculate a stride value for a given data reference  
18 within a loop,  
19 set the stride value to a default stride value if the stride  
20 value cannot be calculated, and to  
21 insert a prefetch instruction to prefetch the given data  
22 reference for a subsequent loop iteration based on the stride value;  
23 wherein the stride value is constant for some but not necessarily all loop  
24 iterations.

1 14. (Original) The apparatus of claim 13, further comprising a  
2 configuration mechanism that is configured to receive the default stride value  
3 from a system user.

1 15. (Original) The apparatus of claim 13, wherein while calculating the  
2 stride value, the insertion mechanism is configured to:  
3 identify an induction variable for the stride value;

4           identify a stride function for the stride value; and to  
5           calculate the stride value based upon the stride function and the induction  
6   variable.

1           16. (Original) The apparatus of claim 13, wherein the insertion mechanism  
2   is configured to:

3           calculate a prefetch cover distance by dividing a cache line size by the  
4   stride value;  
5           calculate a prefetch ahead distance as a function of a prefetch latency, the  
6   prefetch cover distance and an execution time of a loop; and to  
7           calculate a prefetch address by multiplying the stride value by the prefetch  
8   cover distance and the prefetch ahead distance and adding the result to an address  
9   accessed by the given data reference.

1           17. (Original) The apparatus of claim 13, wherein the apparatus resides  
2   within a compiler.

1           18-45 (Canceled).